REMARKS

Claim 1 has been amended to introduce the feature that the signal fed to the loop filter corresponds to the least significant N-n bits of the signal input to the quantizer. This feature corresponds to the feature of Claim 4 which the Examiner indicated as being allowable, if rewritten in independent form.

Claim 21 was also indicated by the Examiner to be allowable if amended to include all the features of the base claim, Claim 18. Claim 18 has been amended to introduce the features of Claim 21.

New Claims 32, 33 and 34 correspond to former Claims 8, 11 and 24 which have been rewritten in independent form including all the limitations of the respective base claims. Claim 31 has also been amended to introduce similar features to Claims 4 and 21, namely to specify that the loop filter is fed with the signal representing the difference between the input and output of the quantizer.

While recognizing that the Examiner has indicated that the amended claims would be allowable, Applicant respectfully presents the following additional comments to clarify the differences between the present invention and the prior art.

The prior art documents cited by the Examiner (Mahieux, Ishikawa and Iwahashi) are all in the field of adaptive predictive coding. Generally in these types of systems, the coders reduce the word length of data in a signal by exploiting short or medium term correlation over time in the signal to be coded. These systems use predictive coding, i.e. estimating the next sample on the basis of past samples. The predicted values are then compared to the actual values to be transmitted to determine the error. It is only the, usually small, error which is then coded and transmitted. This allows a reduction in the amount of data transmitted. At the receiver, the same

prediction process is carried out. The predicted value is then added to the error value which is received from the transmitter, to regenerate the correct original signal. In other words, only the error signals are transmitted which are then processed using significant processing at the receiver to regenerate the original signal.

This is fundamentally different from the present invention which merely truncates or quantizes the input signal. The error signal is then fed back to the input to correct for the errors which are introduced due to the quantization process. The purpose of having this heavy negative feedback of the low frequency components (or the quantization error) is to minimize the low frequency components of the error in the output stream. The output of the circuit is a directly usable word length reduced version of the input audio signal.

The purpose of the present invention is to give a flat frequency response across the circuit to maximize the signal quality, especially for audio applications. This is achieved using a simple low-coefficient word length filter structure. This allows the circuit to be implemented simply, minimizing chip area and hence cost.

In contrast, Mahieux and the other two documents cited all differ substantially from the present invention in that they process the signal in blocks to make use of short and medium term correlation and generate a signal which is not representative of an audio signal and can only be converted back to an audio signal by significant processing.

Accordingly, one of skill in the art seeking to improve the systems set forth in the admitted prior art would not even look to an arrangement such as Mahieux. While the topology of the Mahieux document is superficially similar to the arrangement shown in the figures of the present application, it is only with the benefit of hindsight

that such a comparison can be made. In reality, at the filing date of this application, one of skill in the art starting with the acknowledged prior art would simply not look to the teaching of Mahieux, as that arrangement would not have anything to offer in the context of the present invention which aims to process an audio signal whilst maintaining the flatness of the response of the circuit and also achieving this in an economic manner whilst still providing an output signal which can be directly used by circuits and components downstream. In contrast, Mahieux provides a rather complex solution to achieve a different end. Furthermore, the signal path would not generally be flat since it uses the signal as a feedback rather than just the error component.

The purpose of the feedback loop in the present invention and in the prior art document is also quite different. In the present invention, the feedback is to mitigate the effect of the quantization noise. In contrast, the predictive coding systems of the prior art use feedback to provide a predicted value for the next sample so that the error signal can be determined. Accordingly, one of skill in the art faced with the problem to be solved by the present invention would not be taught anything by any of the three cited prior art documents.

Furthermore, as acknowledged by the Examiner, revised Claims 1 and 18 make use of the least significant bits of the input signal to provide the feedback signal input. This is not disclosed in any of the prior art documents. Similarly, none of the prior art documents disclose a loop filter comprising limiters to limit the signal level and scaling factors to normalize signal dynamic ranges, as specified in Claim 32. Similarly, the estimation algorithms of new Claims 33 and 34 are not taught by the prior art documents.

In view of both the above comments, applicant submits that one of skill in the art starting with the admitted prior art would not look to Mahieux or the other two

cited documents and, even if one of skill in the art were to look at these documents, he would not be taught to modify the admitted prior art to arrive at the present invention. Applicant therefore submits that the present invention as now claimed is both novel and inventive over the prior art.

In view of the foregoing, Applicant submits that the present application is in condition for allowance, and such action is earnestly solicited.

Dated: December 28, 2005

Respectfully submitted,

By

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